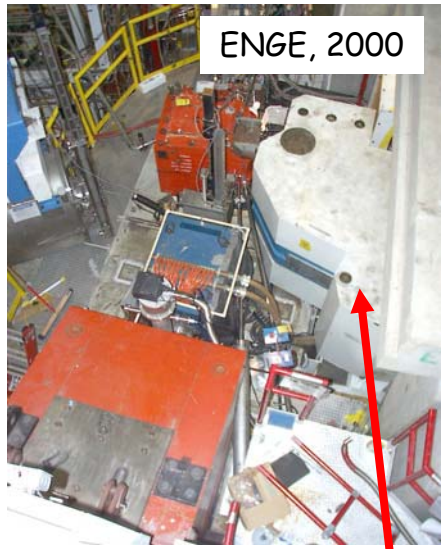
An Example of a Thorough Work Hazard Analysis

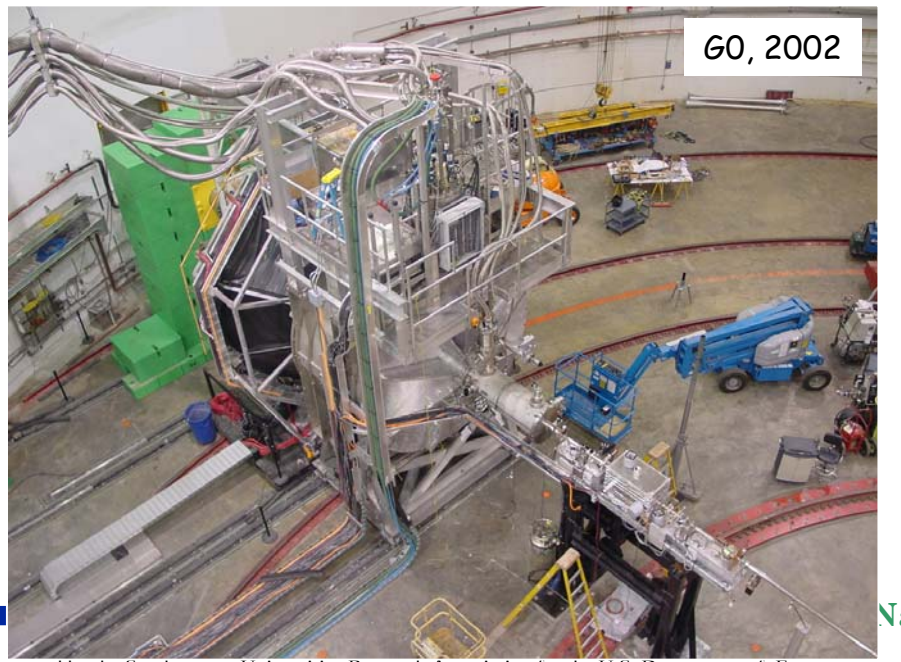
Rolf Ent
Physics Division

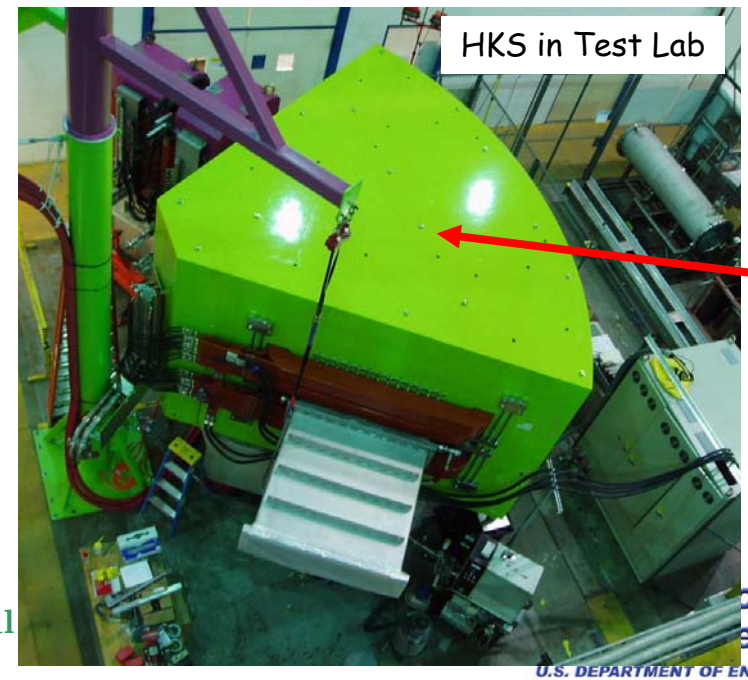
Hall C Schedule

• Thru January 25, 2005	HMS + SOS Runs
• January 26-June 01, 2005	HKS Installation
• June 02-August 31, 2005	HKS Runs
• September-November 2005	HKS Deinstallation, GO Reinstallation
• December 2005	GO Engineering Run
• January-June 2006	GO Backward Run

Home of the Large Installations







Process after Experiment Approval

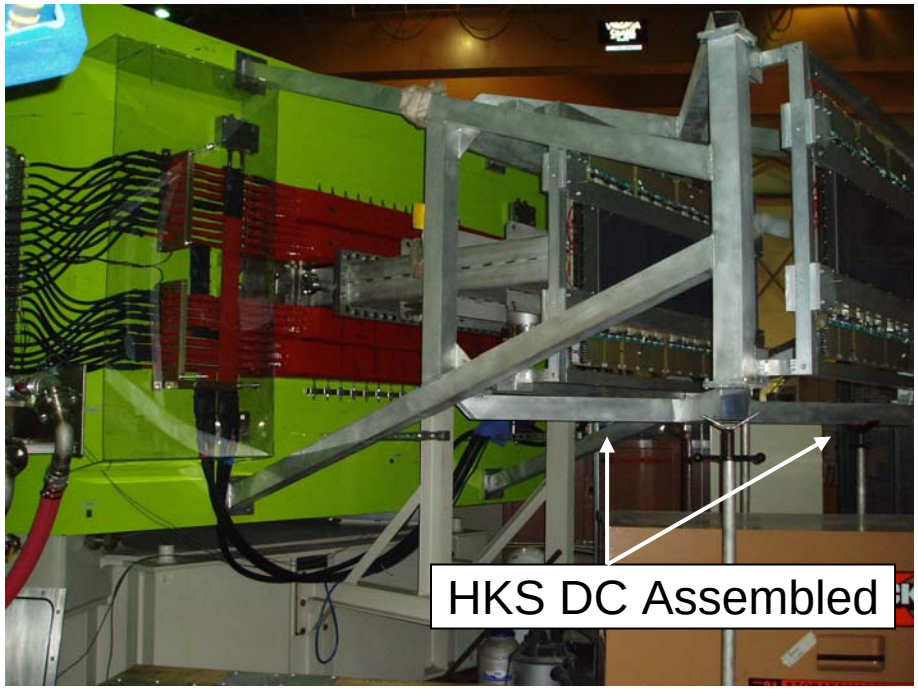
- Readiness Reviews are required for all major installation experiments. The process is described in EH&S Manual Chapter 3120.
- Assure that the experiment will have a high probability of being scientifically successful and operating in an efficient and safe manner.
- The "HKS" experiment: new HKS spectrometer (Tohoku University) and beam line (JLab), existing ENGE spectrometer (Hampton University, also used in 2000 experiment).
- 1st HKS Readiness Review : November 19, 2001
  - Before the construction phase of the major new equipment
  - Committee: Roger Carlini, Hari Areti, John Domingo, Dave Kashy, Stan Kowalski (MIT), John Lerose, Stan Majewski, Philip Pile (BNL), Greg Smith
  - Many findings on spectrometer/magnet design and optics, detector systems, beam associated backgrounds, cost & schedule, installation, manpower
  - EH&S Example: Monte-Carlo simulation recommended to understand radiation backgrounds induced by downstream beam line chicane.

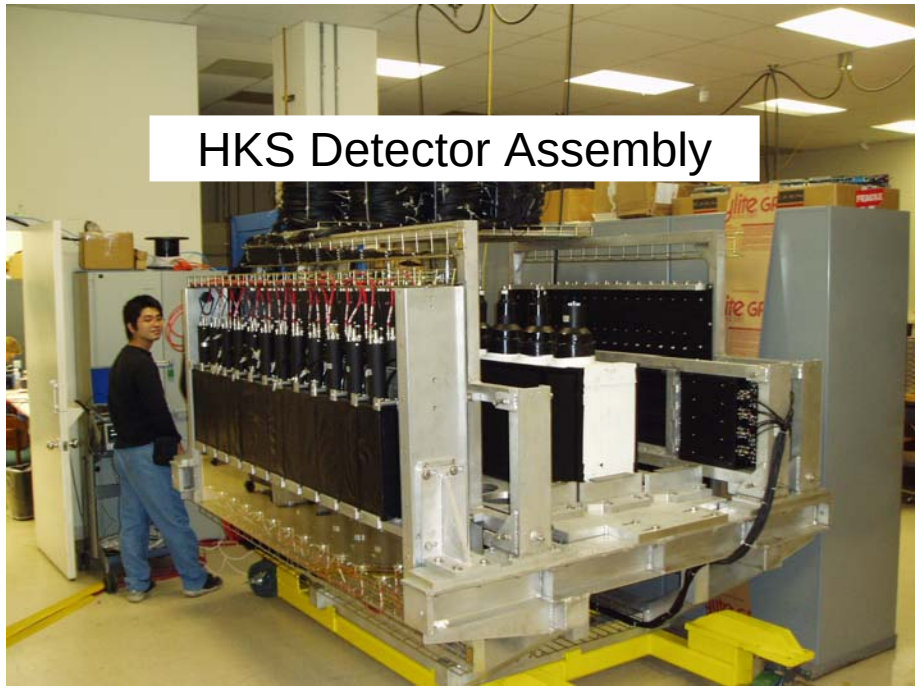
Process after Experiment Approval

- 2nd HKS Readiness Review : May 13, 2003
  - Before the request for scheduling
  - Committee: Roger Carlini, Hari Areti, Butch Dillon-Townes, Howard Fenker, Gregg Franklin (CMU), Bert Manzlak, Paul Ulmer (ODU)
  - No major "show stopper" issues or concerns, experiment appears on track for a possible installation as early as Spring/Summer 2004.
  - "Punch list" of concerns and issues to resolve
  - EH&S Example of Concern: "only a very sketchy outline of downstream beam line instrumentation was presented" → Accelerator Division picks up beam dump line design & engineering
  - EH&S Example of Issue: "The collaboration needs to complete a full GEANT simulation of backgrounds including low-energy backgrounds produced from target generated secondary particles that interact in the magnet iron."

HKS Status – December 2004

Last preparations for HKS installation underway





Ongoing work: finalize assembly of sieve systems (JLab)
construction of beam dump line and new DZ magnet (Accel. Division)
relocate/assemble remaining two aerogel detectors (Collaboration)
finalize analysis software (Collaboration)

Process After Experiment Approval

- 3rd HKS Readiness Review : December 09, 2004
  - Before/during the installation phase of the major new equipment
  - Emphasis is on EH&S, documentation, and operations
  - Draft Experiment Safety Assessment Document reviewed, Radiation Safety Assessment Document reviewed, draft operating procedures reviewed
  - Committee: Franco Garibaldi (INFN), Erik Abkemeier, Ed Daly, Mike Epps, Dave Mack, Bert Manzlak, Steve Williamson (UIUC)
  - No major show stoppers found, HKS should be ready to run in June.
  - EH&S Examples: review final design beam dump line to address shielding/airborne radiation and beam diagnostics concerns, add interlock on door to ENGE detector hut to turn off magnet power, need to develop checklists, etc.

- Note: if specialized equipment such as new superconducting magnets or new cryogenic targets are used, they get separate safety reviews. This was not applicable for the HKS experiment.

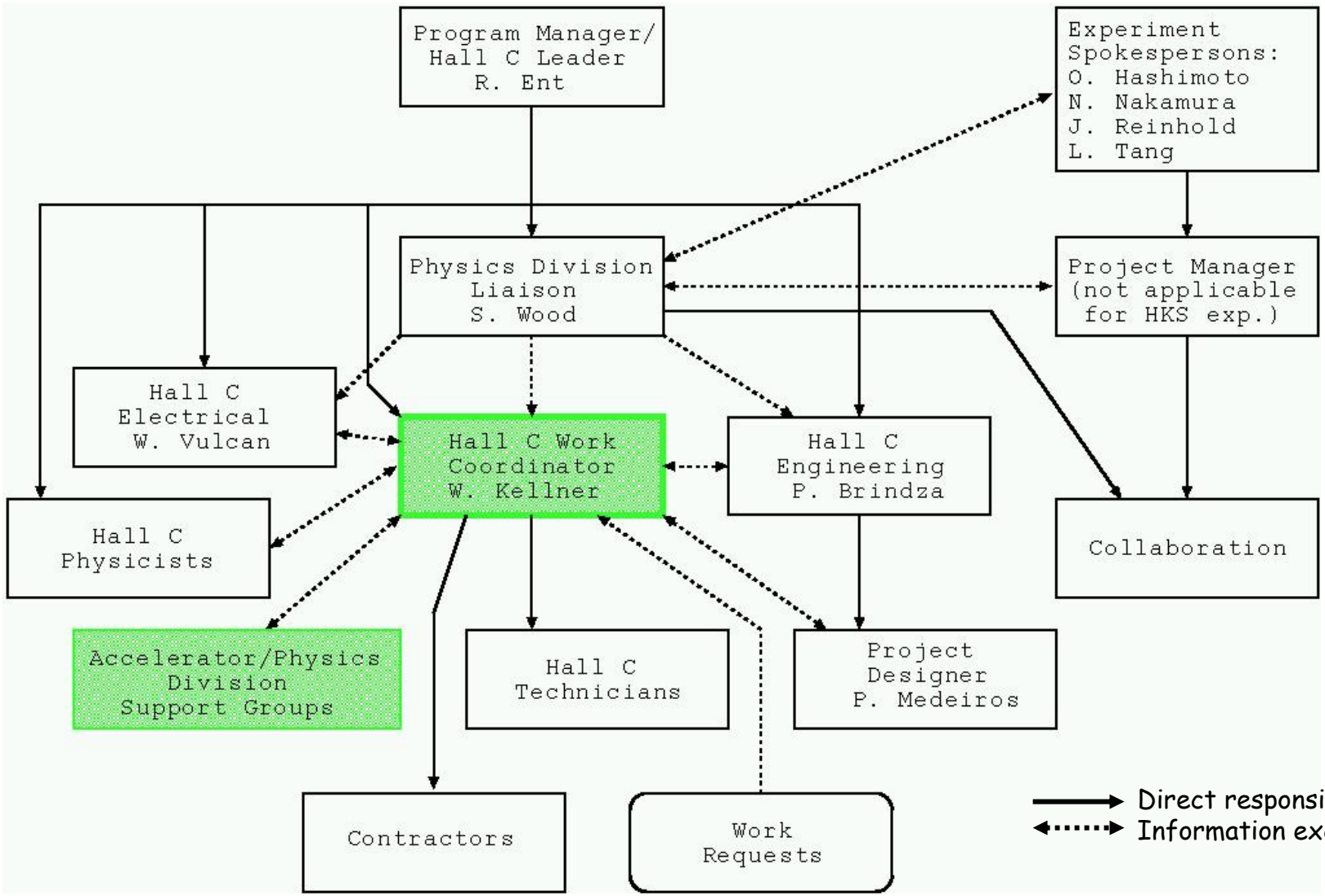
Process Before/During Installation

- **HKS Preparation Meetings** called by Hari Areti with mix of people from Accelerator Division and Hall C.
  - —Agenda items: Status of diagnostics work, safety systems (PSS/MPS), mechanical work, installation schedule
  - —Exchange of e-mails and beam commissioning plan

Process Before/During Installation

- HKS Preparation Meetings called by Hari Areti with mix of people from Accelerator Division and Hall C.
  - Agenda items: Status of diagnostics work, safety systems (PSS/MPS), mechanical work, installation schedule
  - Exchange of e-mails and beam commissioning plan
- Special Conduct Of Operations for Hall C Installations
  - Revised from earlier version for 7-month G0 installation (2002).
  - Outlines single point of contact for installation work in Hall: Walter Kellner
  - Weekly Hall C meetings to go over progress plus discuss EH&S issues
  - Daily meeting of Walter with technicians working in Hall to give job-specific training and discuss safety issues

Organizational Structure of Hall C during HKS Installation



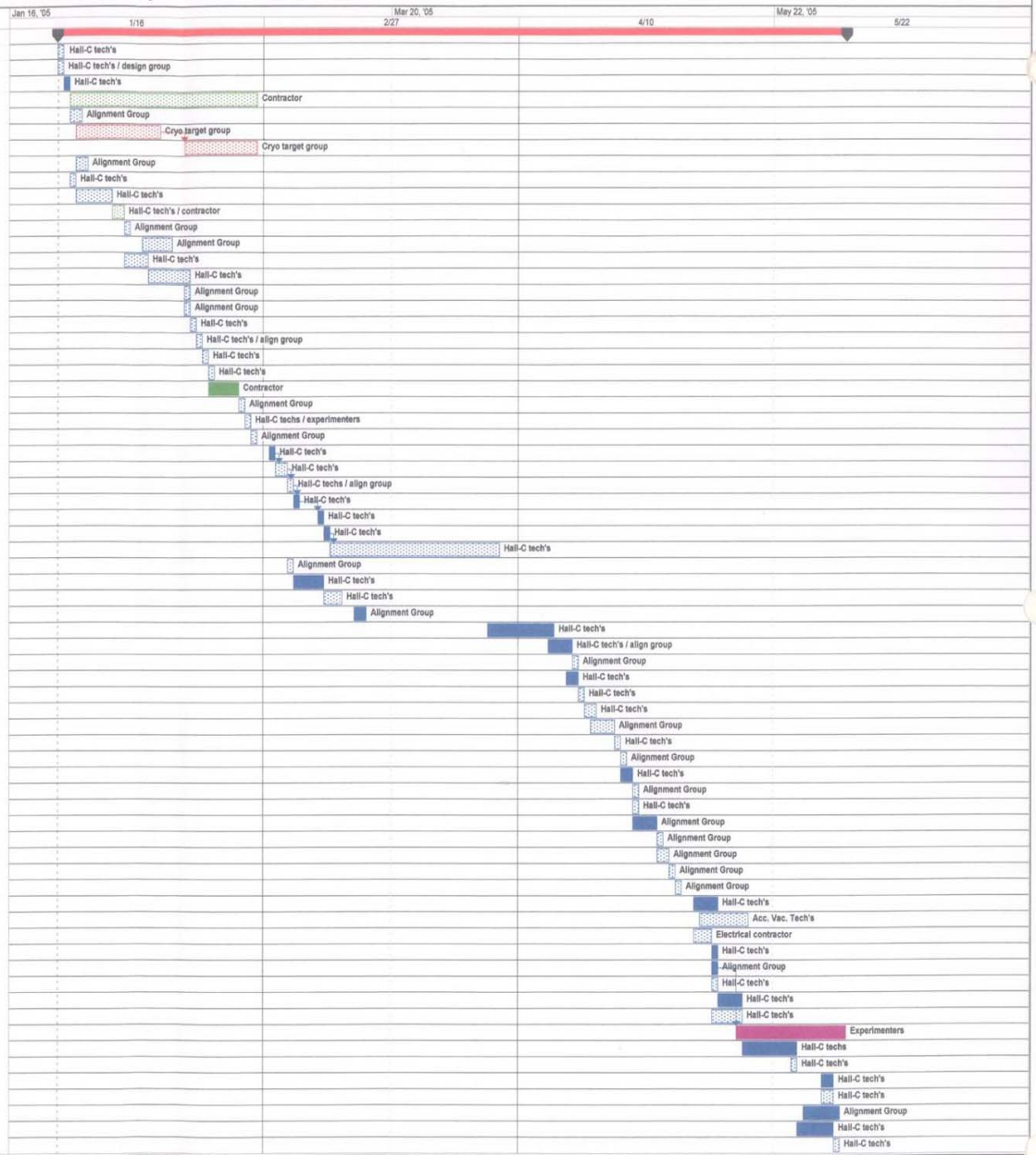
Everybody needs to read & sign new Conduct Of Operations before working in Hall C

Process Before/During Installation

- HKS Preparation Meetings called by Hari Areti with mix of people from Accelerator Division and Hall C.
  - Agenda items: Status of diagnostics work, safety systems (PSS/MPS), mechanical work, installation schedule
  - Exchange of e-mails and beam commissioning plan
- Special Conduct Of Operations for Hall C Installations
  - Revised from earlier version for 7-month G0 installation (2002).
  - Outlines single point of contact for installation work in Hall: Walter Kellner
  - Weekly Hall C meetings to go over progress plus discuss EH&S issues
  - Daily meeting of Walter with technicians working in Hall to give job-specific training and discuss safety issues
- Installation Schedule incorporating known work requests made to Walter Kellner
  - First item is always RadCon check of any beam line components that will need to be moved out of the Hall (indicated with special "RadCon" color on installation schedule)
  - Normally, a preparatory meeting is scheduled with personnel of various groups to go over schedule before installation work starts, for HKS this was integrated in the HKS Preparation Meetings of above.

HKS Installation January 24st to June 1st 2005 Rev. 3

ID	Task Name	Duration	Start	Finish	Resource Names
1	**HKS installation in Hall C**	**94 days?**	**Mon 1/24/05**	**Thu 6/2/05**	
2	Radcon check: Beam line, trash, tools etc.	1 day?	Mon 1/24/05	Mon 1/24/05	Hall-C tech's
3	Move HMS and SOS to large angle, secure pivot railing	1 day?	Mon 1/24/05	Mon 1/24/05	Hall-C tech's / design group
4	Remove beam line and stands, store in RAD container	1 day	Tue 1/25/05	Tue 1/25/05	Hall-C tech's
5	Electrical installation behind HMS, 16:00 to 24:00, crane lockout req.	23 days?	Wed 1/26/05	Fri 2/25/05	Contractor
6	As found alignment check of girder and cryo target	2 days?	Wed 1/26/05	Thu 1/27/05	Alignment Group
7	Disconnect and remove CRYO target	10 days	Thu 1/27/05	Wed 2/9/05	Cryo target group
8	Prepare and machine 8" hole into pivot pin	10 days?	Mon 2/14/05	Fri 2/25/05	Cryo target group
9	Lay out concrete road for HKS dipole	2 days?	Thu 1/27/05	Fri 1/28/05	Alignment Group
10	Remove 2 plastic cable slids, prepare concrete forms	1 day?	Wed 1/26/05	Wed 1/26/05	Hall-C tech's
11	Place concrete forms and anchor-extensions for stands	4 days?	Thu 1/27/05	Tue 2/1/05	Hall-C tech's
12	Pump concrete into forms and level	2 days?	Wed 2/2/05	Thu 2/3/05	Hall-C tech's / contractor
13	Layout ENGE support platform and walkway	1 day?	Fri 2/4/05	Fri 2/4/05	Alignment Group
14	Install new monuments, tie in and establish control	5 days?	Mon 2/7/05	Fri 2/11/05	Alignment Group
15	Move ENGE support and staircase into Hall	2 days?	Fri 2/4/05	Mon 2/7/05	Hall-C tech's
16	Disassemble HKS dipole in T.L. and move yokes to Hall	5 days?	Tue 2/8/05	Mon 2/14/05	Hall-C tech's
17	ENGE hut layout, vertical monitoring	1 day?	Mon 2/14/05	Mon 2/14/05	Alignment Group
18	ENGE, establish temporary control inside hut on floor	1 day?	Mon 2/14/05	Mon 2/14/05	Alignment Group
19	Place ENGE base and anchor bolds	1 day?	Tue 2/15/05	Tue 2/15/05	Hall-C tech's
20	ENGE base alignment and bolt to floor	1 day?	Wed 2/16/05	Wed 2/16/05	Hall-C tech's / align group
21	Build concrete forms and poor grout for ENGE base	1 day?	Thu 2/17/05	Thu 2/17/05	Hall-C tech's
22	Place staircase on ENGE table	1 day?	Fri 2/18/05	Fri 2/18/05	Hall-C tech's
23	Move ENGE magnet to Hall and place on stand	3 days	Fri 2/18/05	Tue 2/22/05	Contractor
24	Align ENGE magnet	1 day?	Wed 2/23/05	Wed 2/23/05	Alignment Group
25	Place ENGE drift chambers and hodoscope	1 day?	Thu 2/24/05	Thu 2/24/05	Hall-C techs / experimenters
26	Align drift chambers and hodoscope	1 day?	Fri 2/25/05	Fri 2/25/05	Alignment Group
27	Move new HKS dipole base into position,	1 day	Mon 2/28/05	Mon 2/28/05	Hall-C tech's
28	Assemble Hydraulic system and roller base	2 days?	Tue 3/1/05	Wed 3/2/05	Hall-C tech's
29	Align new dipole base	1 day?	Thu 3/3/05	Thu 3/3/05	Hall-C techs / align group
30	Transport Q1 & Q2 and coils from T.L. to Hall-C	1 day	Fri 3/4/05	Fri 3/4/05	Hall-C tech's
31	Move dipole frame from T.L. to Hall C and position on base	1 day	Tue 3/8/05	Tue 3/8/05	Hall-C tech's
32	Move fall protection pole to Hall, place and anchor	1 day	Wed 3/9/05	Wed 3/9/05	Hall-C tech's
33	Assemble dipole and place both quadro poles	20 days	Thu 3/10/05	Wed 4/6/05	Hall-C tech's
34	Layout DZ and EZ magnet stand	1 day?	Thu 3/3/05	Thu 3/3/05	Alignment Group
35	Place DZ and EZ stand and grout	3 days	Fri 3/4/05	Tue 3/8/05	Hall-C tech's
36	Mount DZ and EZ magnets on to stands	3 days?	Wed 3/9/05	Fri 3/11/05	Hall-C tech's
37	Final alignment and DZ and EZ magnet	2 days	Mon 3/14/05	Tue 3/15/05	Alignment Group
38	Leak check dipole vacuum chamber	9 days	Tue 4/5/05	Fri 4/15/05	Hall-C tech's
39	Re-fiducialize/align dipole and both quadro poles	2 days	Fri 4/15/05	Mon 4/18/05	Hall-C tech's / align group
40	Hut layout, vertical monitoring	1 day?	Tue 4/19/05	Tue 4/19/05	Alignment Group
41	Assemble magnet access platform (for ENGE, splitter, Q1, Q2)	2 days	Mon 4/18/05	Tue 4/19/05	Hall-C tech's
42	Place and secure ENGE staircase to platform.	1 day?	Wed 4/20/05	Wed 4/20/05	Hall-C tech's
43	Install splitte/Q1/Q2 magnet access platform and staircase	2 days	Thu 4/21/05	Fri 4/22/05	Hall-C tech's
44	Align access platform	2 days	Fri 4/22/05	Mon 4/25/05	Alignment Group
45	Place splitter magnet pedestal	1 day?	Tue 4/26/05	Tue 4/26/05	Hall-C tech's
46	Splitter magnet/fission chamber pedestal layout/align	1 day?	Wed 4/27/05	Wed 4/27/05	Alignment Group
47	Install splitter magnet/sivslit/baseplate assembly., pre align	2 days	Wed 4/27/05	Thu 4/28/05	Hall-C tech's
48	Splitter magnet alignment	1 day?	Fri 4/29/05	Fri 4/29/05	Alignment Group
49	Mount drift chamber frame to dipole	1 day?	Fri 4/29/05	Fri 4/29/05	Hall-C tech's
50	Install drift chambers	2 days	Fri 4/29/05	Mon 5/2/05	Alignment Group
51	Align drift cambers	1 day?	Tue 5/3/05	Tue 5/3/05	Alignment Group
52	Establish temporary control in hut on floor	2 days?	Tue 5/3/05	Wed 5/4/05	Alignment Group
53	Spectrometer final alignment	1 day?	Thu 5/5/05	Thu 5/5/05	Alignment Group
54	Q1 and Q2 final alignment	1 day?	Fri 5/6/05	Fri 5/6/05	Alignment Group
55	Install dipole detector shield hut (without roof beams)	4 days	Mon 5/9/05	Thu 5/12/05	Hall-C tech's
56	Assembly beamline sections from splitter to dump 24" dumpline	6 days?	Tue 5/10/05	Tue 5/17/05	Acc. Vac. Tech's
57	Electric power to both shield huts	3 days?	Mon 5/9/05	Wed 5/11/05	Electrical contractor
58	Crane in detector stack assembly	1 day	Thu 5/12/05	Thu 5/12/05	Hall-C tech's
59	Align detector stack	1 day	Thu 5/12/05	Thu 5/12/05	Alignment Group
60	Place dipole power supply and install cable trays.	1 day	Thu 5/12/05	Thu 5/12/05	Hall-C tech's
61	Close up detector hut (place roof beams)	2 days	Fri 5/13/05	Mon 5/16/05	Hall-C tech's
62	Install Schield wall and He tube after first beam bend	3 days?	Thu 5/12/05	Mon 5/16/05	Hall-C tech's
63	Place cables, connect and debug detectors	14 days	Mon 5/16/05	Thu 6/2/05	Experimenters
64	Complete ENGE shielding hut	7 days	Tue 5/17/05	Wed 5/25/05	Hall-C techs
65	Install 2 cable trays (1 from G-0 and 1 from the truck ramp wall)	1 day	Wed 5/25/05	Wed 5/25/05	Hall-C tech's
66	Install beam pipe supports and beam line	2 days	Mon 5/30/05	Tue 5/31/05	Hall-C tech's
67	Set up vacuum pumps, pump and leak check vacuum line	2 days?	Mon 5/30/05	Tue 5/31/05	Hall-C tech's
68	Complete final alignment	4 days	Fri 5/27/05	Wed 6/1/05	Alignment Group
69	Finalize all electrical and LCW connections	4 days	Thu 5/26/05	Tue 5/31/05	Hall-C tech's
70	Clean up Hall C, remove lifts, ladders, slings etc.	1 day	Wed 6/1/05	Wed 6/1/05	Hall-C tech's



Project: HKS installation 2005 rev3.pd
Date: Mon 1/24/05

Rev.3

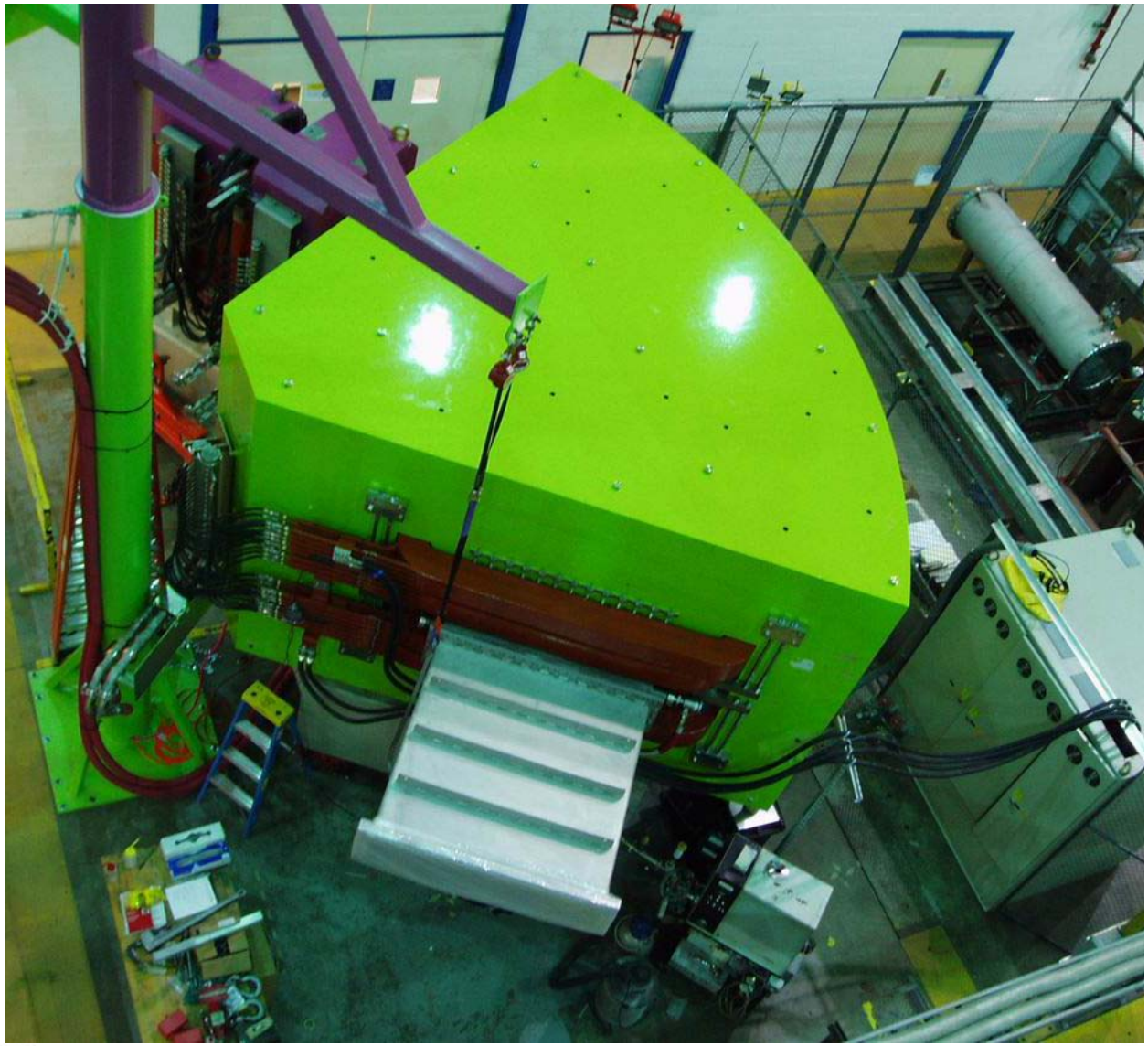
Task · Split · Progress · Milestone · Summary · Project Summary · External Tasks · External Milestone · Deadline

For information and changes contact the the Hall-C coordinator: Walter Kellner, ext. 5512, pager 872-5563, cell 897-5728

Work Hazard Identification 32

- **Installation Schedule** (draft only, this is a working document) has 70 entries at present.
- EH&S and Hall C personnel identify potential high-risk jobs, and produce (in collaboration) a **Hazard Identification Worksheet** and subsequently a **Task Hazard Analysis** for these specific tasks.
- Highest-risk mechanical task: HKS spectrometer move from Test Lab to Hall C.
- Highest-risk electrical task: Connect to new Electrical Panel after 2MVA Power Upgrade work in Hall is complete.

Task: HKS needs to move from Test Lab to Hall C



HKS Assembly in Test Lab (Dec. 2003)

(Note: Dipole had already been assembled at Mitsubishi for magnet mapping, with Hall C work coordinator present at disassembly and Hall C electrical engineer present for initial magnet mapping – both at Tohoku University's request)

HKS consists of many 15-metric tons parts that we assemble piece by piece.

A special boom is used for fall protection tie off (we rotate the beam in Hall C). Here the boom is load tested.

Hazard Identification Worksheet

Task title: Move of HKS **Date:** 01-20-05

Location: Test Lab (Bldg 58), BCS Road, SURA Road, CEBAF Blvd., access roadway, Hall C (Bldg. 96)

Name: Walter Kellner, Bert Manzlak, Rolf Ent

Instructions:

Answer the following questions.

Questions with answers that indicate a hazard may exist should be discussed with your supervisor/manager/EH&S staff.

Resolutions and hazard mitigations must be noted in the block provided.

General Conditions	Keywords	Y/N	Resolutions
1. Are you familiar with the MSDS requirements for the materials being used and the required Personal Protective Equipment (PPE)?	Acids, flammable gases and solvents, heavy metals (lead, etc.), respirator, gloves, aprons, face shield, safety glasses, working with flammables	N	
2. Will you create dust, welding arcs, heat, excessive noise, ionizing/non-ionizing radiation, or chemical mixtures during the tasks?	Welding grinding, painting, x-rays, respirator, gloves, RF, lasers, chemicals, epoxies	N	
3. Are there any fire or explosive hazards associated with the task or likely to develop because of the task?	Painting, welding, grinding, brazing, mixing chemicals, battery charging	N	
4. Could the task create headaches, breathing problems, or dizziness from odors, etc.?	Motor exhaust, painting, ozone, solvents, acids, bases, chemicals, portable heaters	N	

5. Is the task performed where limited entry, egress, or poor ventilation exists?	Confined space, manholes, pits, tanks	N	
6. Does the task require compressed, liquefied, or noxious gases?	Cryogenics, nitrogen, helium, argon, carbon monoxide	N	
7. Does the task require work in areas or with materials subject to temperature extremes?	Welding, soldering, brazing, cryogenics, resistive heating	N	
8. Does the task involve the use of fork trucks, hoists, or cranes?	Man lifts, subcontractors, rentals, slings, rigging	Y	See Worksheet Item 1
9. Does the task involve the use of powered hand tools?	Drills, saws, PPE, GFCI, power activated tools	N	
10. Does the work involve the risk of electrical shock or other forms of hazardous energy?	LOTO, compressed gases, lasers, power supplies, pressure, cryogenics	N	
11. Does the task involve working above or below floor level?	ladders, scaffolds, ODH, fall protection, confined space	Y	See Worksheet Item 2
12. Does the task involve lifting, pulling, pushing, or carrying heavy objects, or repetitive motion?	posture, back injury, twisting, fork lifts, cranes	Y	See Worksheet Item 3
13. Does the task involve work with pressurized or vacuum vessels?	resistive heaters, GFCI, pressure relief, tanks, containers	N	
14. Does the task require any permits?	TOSP, RWP, FHWP, confined space, Electrical Service Work Permit	N	
15. Does the task require specialized training?	Subcontractors, scaffold, man lift, confined space	Y	See Worksheet Item 4
16. Will waste products require special handling or disposal requirements?	chemicals, by products, discharges to sewer or ground, HRSD	N	
17. Any other hazards we may have overlooked with this list?		N	

Thomas Jefferson National Accelerator Facility

EH&S Manual

3210-T2 Hazard ID Worksheet

Task title: Move of HKS **Date:** 01-20-05

This worksheet is intended as just a starting point. Having identified the hazards associated with this task, next review the associated guidance in the EH&S Manual and develop procedures and controls tailored to the work.

Task title: Move of HKS **Date:** 01-20-05

Cause	Hazard		Mitigation – Administration	Mitigation – Engineering	Risk Code
Hazard Identification Worksheet # 08 **Item 1** Does the task involve the use of fork trucks, hoists, or cranes?	Struck-by falling objects Property Damage		• Authorized and trained personnel • Guidance in JLab EH&S Manual Chapters: 6140 - Cranes and Hoists, 6145 - Forklifts, 6147 - Aerial Work Platforms	• Select certified and inspected material handling equipment, also includes: transport vehicle and trailer.	(B – III) **2**
Hazard Identication Worksheet # 11 **Item 2** Does the task involve working above or below floor level?	Fall Property Damage		• Authorized and trained personnel • Guidance in JLab EH&S Manual Chapters: 6131 Trip and Fall Protection 6147	• Authorized and inspected boom.	(B – III) **2**

EH&S Manual

3210-T2 Hazard ID Worksheet

Cause	Hazard		Mitigation – Administration	Mitigation – Engineering	Risk Code
Hazard Identication Worksheet # 12 **Item 3** Does the task involve lifting, pulling, pushing, or carrying heavy objects, or repetitive motion?	Musculo - skeletal injury Property Damage		• Authorized and trained personnel • Guidance in JLab EH&S Manual Chapters: 6140 6145 6147	• Select certified and inspected material handling equipment, also to include: transport vehicle and trailer.	(A – III) **1**
Hazard Identification Worksheet # 15 **Item 4** Does the task require specialized training?	Being uninformed of the daily work environment Property Damage		• Read and sign the Hall C Conduct of Operations (COO) for HKS Installation • SAF 112 Hall C EH&S Awareness Training	None	(A – III) **1**

Task Hazard Analysis Worksheet

Date: 01-20-05 **Division Task Number:** THA-PHY-05-001 **Frequency of Use:** Once

Task location: Test Lab / Hall C	**Task Title:** Move of HKS
Division: Physics	**Prepared by:** Bert Manzlak, Walter Kellner, Rolf Ent
Department: Hall C	**Reviewed by:** Manny Nevarez and Suresh Chandra
Hall Leader: Rolf Ent	**Approved by:** Dennis Skopik
Standard Requirements: Fall Protection, Material Handling - Crane and Rigging, SAF 112, HKS Install.COO	

Sequence of Job Steps	Potential Hazards	Safe Procedures / Practices/Controls	Risk Code
1. Disassemble HKS in <15 metric tons pieces in Test Lab.	Pieces fall off crane, personnel fall hazards	A. use of proper torque settings and slings B. two people oversight C. tie off on existing authorized boom (also used during the assembly in Test Lab) D. Hall C work coordinator's daily planning meeting at 8 am, and a task specific meeting with Hall C technicians before each job assignment.	B - III 2
2. Transportation of pieces to Hall C	Pieces slide off trailer	A. Use proper rigging on trailer B. Use of commercial trucker straps (available in Hall C) C. Personnel appropriately trained for rigging job	A - III 1
3. Temporarily stacking of pieces in Hall C.	Blocks stacked improperly (without paying attention to center of gravitation)	A. Use and dedicated person stacking pieces B. Two people oversight	B - III 2

Continued on next page

Jefferson Lab

Thomas Jefferson National Accelerator Facility

EH&S Manual

3210-T3 Task Hazard Analysis Worksheet

Sequence of Job Steps	Potential Hazards	Safe Procedures / Practices/Controls	Risk Code
3. Continued from previous page		C) Hall C work coordinator's daily planning meeting at 8 am, and a task specific meeting with Hall C technicians before each job assignment.	
4. Assemble HMS magnet in Hall C	Pieces fall of crane, personnel fall hazards	A. use of proper torque settings and slings B. Two people oversight C. tie off on existing authorized boom (also used during the assembly in Test Lab) D. Hall C work coordinator's daily planning meeting (8 am), and a task specific meeting with Hall C technicians before each job assignment.	B - III 2

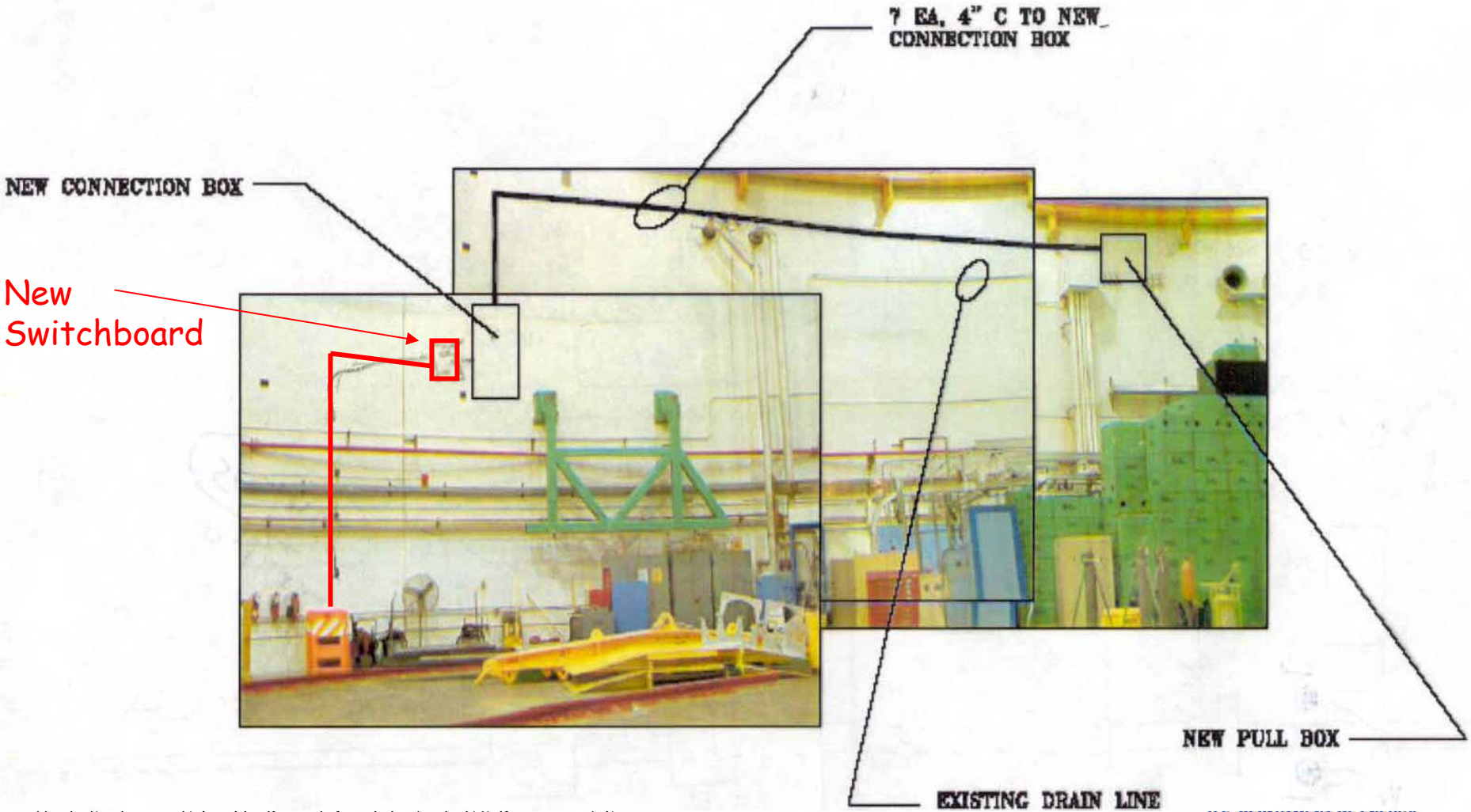
Division Task Number: THA - PHY - 05 - 001

Hall Leader	Rolf Ent
Hall Work Coordinator	Walter Kellner
JLab Material Handling Safety Representative	Manny Nevarez
E^2 RC Member	Suresh Chandra
Division EH&S	Bert Manzlak
Division Safety Officer	Dennis Skopik

01/24/05
1-27-05
1-27-05
1-27-05
1/27/05

Task: Installation of AC power for HKS Power Supply

Note: Related earlier task is Installation of 2MW 480A Feeder in Hall C (Subcontracted by Facilities Management)



Hazard Identification Worksheet

Task title: Installation of AC power for HKS power supply Date: 1/26/05
Location: Hall C
Name: Bill Vulcan Co-workers: Accelerator Electricians

Instructions: Answer the following questions. Questions with answers that indicate a hazard may exist should be discussed with your supervisor/manager/EH&S staff. Resolutions and hazard mitigations must be noted in the block provided.

General Conditions	Keywords	Y/N	Resolutions
1. Are you familiar with the MSDS requirements for the materials being used and the required Personal Protective Equipment (PPE)?	acids, flammable gases and solvents, heavy metals (lead, etc.), respirator, gloves, aprons, face shield, safety glasses, working with flammables	N	
2. Will you create dust, welding arcs, heat, excessive noise, ionizing/non-ionizing radiation, or chemical mixtures during the tasks?	welding grinding, painting, x-rays, respirator, gloves, RF, lasers, chemicals, epoxies	Y	Earplugs
3. Are there any fire or explosive hazards associated with the task or likely to develop because of the task?	painting, welding, grinding, brazing, mixing chemicals, battery charging	N	
4. Could the task create headaches, breathing problems, or dizziness from odors, etc.?	Motor exhaust, painting, ozone, solvents, acids, bases, chemicals, portable heaters	N	
5. Is the task performed where limited entry, egress, or poor ventilation exists?	confined space, manholes, pits, tanks	N	
6. Does the task require compressed, liquefied, or noxious gases?	cryogenics, nitrogen, helium, argon, carbon monoxide	N	
7. Does the task require work in areas or with materials subject to temperature extremes?	welding, soldering, brazing, cryogenics, resistive heating	N	
8. Does the task involve the use of fork trucks, hoists, or cranes?	manlifts, subcontractors, rentals, slings, rigging	Y	See analysis item 1
9. Does the task involve the use of powered hand tools?	drills, saws, PPE, GFCI, power activated tools	Y	See analysis item 2
10. Does the work involve the risk of electrical shock or other forms of hazardous energy?	LOTO, compressed gases, lasers, power supplies, pressure, cryogenics	Y	See analysis item 3
11. Does the task involve working above or below floor level?	ladders, scaffolds, ODH, fall protection, confined space	Y	See analysis item 4
12. Does the task involve lifting, pulling, pushing, or carrying heavy objects, or repetitive motion?	posture, back injury, twisting, fork lifts, cranes	Y	See analysis item 5
13. Does the task involve work with pressurized or vacuum vessels?	resistive heaters, GFCI, pressure relief, tanks, containers	N	
14. Does the task require any permits?	TOSP, RWP, FHWP, confined space, Electrical Service Work Permit	N	
15. Does the task require specialized training?	subcontractors, scaffold, manlift, confined space	Y	LOTO,Manlift,Hallc,ODH,RW1
16. Will waste products require special handling or disposal requirements?	chemicals, by products, discharges to sewer or ground, HRSD	N	
17. Any other hazards we may have overlooked with this list?		N	

Task Hazard Analysis Worksheet

Date: 1/26/05 **Division Task Number**_____ **Frequency of use:** once

Task location: Hall C	**Task title:** Installation of power for HKS
Division: Physics	**Prepared by:** Rolf Ent, Bill Vulcan, Bert Manzlak
Department: Hall C	**Reviewed by:** Jonathan Creel, Steve Christo
Supervisor: Rolf Ent	**Approved by:** Dennis Skopik
Standard Requirements: ILG Ladders Electrical.	

Sequence of Job Steps	Potential Hazards	Safe Procedures/Practices/Controls	Risk Code
1. Install Switchboard on wall for HKS power supply.	Material handling Conduit falling from high places.	Will be LTT. Cordon of area. Two people oversight.	C1 Class 1
2.Tasks involves power tools.	Cuts	Workers are experienced Using hand tools.	A2 Class 0
3.Risk of shock.	Arc flash hazard Could be dangerous if connected wrong.	Circuit will be locked off (LOTO) at the transformer.	A1 Class 0
4.Working on ladder or aerial lifts	Falling	Workers are trained working in aerial lifts	B1 Class 0
5. Carry heavy material.	Back injuries, posture twisting	Workers are trained for lifting objects	B1 Class 0

Summary

- HKS Installation Hall C is a 4+ Month Installation
- Series of Readiness Reviews Locate Long-Term Issues & Concerns, both physics and EH&S related; involve EH&S personnel as early (and often) as possible
- Engineering controls always get the emphasis
- Specific new equipment gets dedicated safety review (not relevant in this HKS case)
- Series of organizational meetings between accelerator and physics division to prepare for large installation and define jobs and responsibilities
- Specific tasks such as HKS move have been well organized far in advance (choice to have "lego"-system, specific job training for coordinators in Japan)
- Responsible personnel (+EH&S personnel) perform Task Hazard Analysis for specific, potentially unsafe, tasks
- **Strategy is to get all jobs to lowest-class level possible**

- QUESTIONS –

THANK YOU